



May 14, 1993

Mr. D. Wayne Hedberg  
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Minerals Regulatory Program  
State of Utah  
Department of Natural Resources  
Division of Oil, Gas and Mining  
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MAY 19 1993

DIVISION OF  
OIL, GAS & MINING

**RE: Escalante Tailings Impoundment Reclamation Plan, M/021/004**

Dear Mr. Hedberg:

Hecla has reevaluated the proposed design of the impoundment cover at the Escalante Unit. Based on this reevaluation, Hecla is proposing a modification to the cover construction design. This modification would utilize a capillary barrier instead of the clay cap. In previous correspondence with Hecla, the Division of Oil, Gas, and Mining (DOGM) has stated that consideration would be given to use of a capillary barrier design, as opposed to a clay-cap design, provided that Hecla could demonstrate that the capillary barrier option would keep unacceptable amounts of moisture from reaching the tailings.

The proposed cover would be constructed as follows:

- a ten inch mine waste rock layer,
- an eight inch subsoil layer, and
- six inches of topsoil.

The lower few inches of waste rock would provide a capillary barrier for upward migration of moisture and associated salts. We believe that construction of a capillary barrier, as outlined in this letter, is more desirable than the clay-cap design for the reasons described below.

1. **Infiltration of Precipitation:** Hecla's hydrogeologic consultant, Grant, Schrieber, and Associates (GSA), used the HELP model to compare the infiltration of moisture through the cover with varying amounts of wasterock and subsoil. Specifically, three cover scenarios were modeled with cover layer thicknesses as presented in Table 1.

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Table 1 - HELP Model Cover Layer Thickness Scenarios

Scenario No.	Wasterock Layer (inches)	Subsoil Layer (inches)	Topsoil Layer (inches)
1	12	6	6
2	6	12	6
3	0	18	6

The report of the modeling is enclosed for your review. In summary, the modeling indicates that a six inch subsoil layer, in combination with the wasterock and topsoil layers, will be almost as effective in reducing percolation into the tailings as the six-inch clay cap. HELP modeling of the cover with a clay cap indicated an average percolation of 0.0839 inches per year through the cover onto the tailings (see the June 28, 1991, report by GSA entitled "Cyanide Transport Modeling - Escalante Mine Tailings Impoundment", copies of the pertinent pages from this report are enclosed for your reference). HELP modeling of twelve inches of wasterock indicated an average percolation of 0.1058 inches per year into the tailings. As stated in the enclosed report, there is essentially no difference between the two cases.

The predominant factor in percolation through the cover is the arid environment. Also, a successful vegetative cover would provide for evapotranspiration of the precipitation that might percolate into the cover. Because of the arid environment and the evapotranspiration, the material of construction is of much less significance in controlling water percolation into the tailings. In other words, the hydraulic conductivity of the clay cap does not make a significant difference on resulting infiltration.

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- 2. Tailings as a Restrictive Barrier:** The tailings themselves can be used as restrictive barrier similar to the function of the clay cap. Compacting the uppermost layer of tailings would reduce the permeability, effectively reducing the water infiltration. Although the permeability will not be as low as the clay cap, compaction of the uppermost layer of tailings should produce a permeability on the order  $1 \text{ E-6 cm/sec}$ . Testing of the tailings has demonstrated that the average permeability is  $1.9 \text{ E-5 cm/sec}$  without this additional compaction effort.
- 3. Land Disturbance:** Use of the wasterock in the cover construction will not result in any new land disturbance either on Hecla or BLM land. The areas designated for clay salvage will not need to be disturbed and only current roads would be used for haulage of wasterock. Also, the amount of subsoil needed will be

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reduced to approximately 70,000 cubic yards, a reduction of 43% from the previously proposed amount. The subsoils can be obtained in the immediate vicinity of the tailings impoundment. In fact, most, if not all, of the subsoil can be obtained from within the fenced impoundment area.


4. **Planting Medium Depth:** As was comprehensively detailed in Hecla's June 14, 1990, letter to DOGM, the maximum rooting depth at Escalante was determined to be approximately 14 inches by BLM suggested methodology. In summary, during 1990 several soil pits were excavated in the area to determine the actual rooting depth of site vegetation. It was noted in these field observations that sagebrush roots penetrated to approximately 14 inches in depth, while the finer grass and forb roots appeared in only the uppermost eight inches of soil. The maximum root penetration depth should correlate with maximum water infiltration in the soil. The proposed design provides this rooting depth with the subsoil/topsoil cover, while the uppermost few inches of the wasterock layer would also be available for additional rooting depth.

Provided within this letter, I have described several reasons for changing the design of the impoundment cover at the Escalante Unit. The capillary barrier design proposed within this letter is more desirable than the previously proposed clay-cap cover design as it provides essentially the same environmental protection while at the same time limiting the amount of additional land disturbance to accomplish the reclamation.

If this modification is acceptable to you, we would like to start construction of the capillary barrier in late March or early April of 1994 to act as a dust control measure in lieu of applying another coating of dust suppressant. The application of the dust suppressant is quite expensive and provides no long term benefit in the reclamation of the impoundment. We propose to complete the remainder of the reclamation in 1995, allowing a year for settling of the wasterock prior to placing the subsoil on it, as well as an additional year of tailings drying and consolidation.

I look forward to hearing your thoughts on our proposal.

Very truly yours,

  
Gary R. Gamble  
Environmental Engineer

enclosures

cc (w/o enclosures): Larry Drew  
George Wilhelm